Chapter 11: How can I tell if two variables are correlated? Correlation.

Full answers to study questions

1. For these questions you should describe whether the correlation is positive or negative, and describe the strength of the relationship using the standard conventions.
   1.1. A strong positive relationship.
   1.2. A weak negative relationship.
   1.3. This was a bit of a trick question! This r value is not possible as it falls outside of the ± 1 range.
   1.4. A moderate negative relationship.
2. For this question, remember that the degrees of freedom is N-2!
   2.1. r (13) = .613, p < .010
   2.2. r (8) = .426, p > .050
   2.3. r (22) = .426, p < .050 (Note that this finding is significant, whereas the previous finding was not, even though the r value was the same. This is because of the larger sample size in this example.)
   2.4. r (18) = .741, p < .001
3. This was quite a tricky question, so well done if you got the answers right!
   To answer 3.1 and 3.2, you needed to use the column for two-tailed hypotheses with an alpha level of .050. Remember that your correlation value needs to be larger than the critical value, so you need to work down the column until you find the critical value that is closest to, but smaller than, your correlation value. Then look at the df and convert this to the number of participants by adding 2 (df = N-2). To answer 3.3 and 3.4, you needed to start by finding the df (N-2), then find the right row corresponding to this df and look up the critical value for a two-tailed hypothesis with an alpha level of .050.
   3.1. 16 participants
   3.2. 20 participants
   3.3. r = .4438
   3.4. r = .3494

Full answers for additional dataset

1. What method of analysis will you use to analyse this dataset?
   A Pearson's correlation will be used to examine the relationship between two continuous variables: number of shopping trips in the past month and happiness rating.
2. Suggest a suitable hypothesis for this analysis.

There will be a positive correlation whereby the more shopping trips a person makes, the happier they are.

3. Calculate the *r* statistic and determine whether it is significant.

   Note: The step numbers for calculations in the book chapter are repeated here.
   The table covers steps 1-4 of the calculations.

Shopping trips (a)	Happiness (b)	a*b	a^2	b^2
4	5	20	16	25
1	2	2	1	4
6	5	30	36	25
2	4	8	4	16
7	8	56	49	64
9	5	45	81	25
3	1	3	9	1
12	8	96	144	64
6	2	12	36	4
4	3	12	16	9
∑ = 54	**∑ = 43**	**∑ = 284**	**∑ = 392**	**∑ = 237**

5: Calculate $(\sum a)^2$ and $(\sum b)^2$

$(\sum a)^2 = 54^2$

$(\sum a)^2 = 2916$

$(\sum b)^2 = 43^2$

$(\sum b)^2 = 1849$

Values from variable a	Values from variable b	Other values needed
$\sum a = 54$ $\sum a^2 = 392$ $(\sum a)^2 = 2916$	$\sum b = 43$ $\sum b^2 = 237$ $(\sum b)^2 = 1849$	$\sum a*b = 284$ $N = 10$

6: Put the values from the table above into the equation.

$$r = \frac{(10 * 284) - (54 * 43)}{\sqrt{((10 * 392) - 2916) * ((10 * 237) - 1849)}}$$

7: Complete the multiplication sums within the brackets on the lower part of the equation.

$$r = \frac{(2840) - (54 * 43)}{\sqrt{((3920) - 2916) * ((2370) - 1849)}}$$

8: Now do the remaining sums within brackets, the multiplications on the top part and the subtractions on the lower part.

$$r = \frac{(2840) - (2322)}{\sqrt{(1004) * (521)}}$$

9: Next, do the subtraction on the top part and the multiplication on the lower part.

$$r = \frac{518}{\sqrt{523084}}$$

10: Now calculate the square root on the lower part.

$$r = \frac{518}{723.245}$$

11: Finally, calculate the division to calculate the Pearson's *r* value.

$$r = .716$$

4. Interpret and write up your findings using APA standards.

   There is a significant positive correlation between the number of shopping trips per month and level of happiness (r (8) = .716, p < .010).

5. Suggest three possible confounding variables within this study. For each confound, how would you measure it, and how do you think it would change the relationship between shopping and happiness?

   There are lots of different confound that could influence this relationship. One could be income, as you need money to shop, and being on a low income can be associated with low mood. Taking this confound into account might reduce the strength of the relationship. Another confound might be the distance that a person lives from a shopping centre, as living far from a shopping centre might limit the number of trips you can make. It is not clear how this confound might influence happiness though, so it is difficult to predict how it might influence the relationship. Finally, whether the participant is male or female could be a potential confound, and the relationship between the two variables could be different, with a positive relationship for females, and either no relationship or a negative relationship for males. Removing males from this sample might strengthen the correlation.

Are *p* values enough?

There is a significant positive correlation between the number of shopping trips per month and level of happiness (r (8) = .716, p < .010) with a large effect size.